

### **REMARKS**

In the Office Action, the Examiner rejected claims 1-4, 51, 52, 54-58, 60-70, 72-74 and 76-104. By this paper, the Applicants hereby amend independent claims 1, 3, 4, 51, 54, 77, and 93; amend dependent claims 94 and 95; cancel dependent claim 96; and add new dependent claims 105-107 for clarification of certain features to expedite allowance of the present application. These amendments and new claims do not add any new matter. In view of the foregoing amendments and the following remarks, the Applicants respectfully request reconsideration and allowance of all pending claims.

### **Rejections Under 35 U.S.C. § 102**

The Examiner rejected claims 77, 89, 93, 78, 94, 96, 79, 97, 81, 99, 83, 101, 84, 102, 86, 90, 103, 88 and 92 under 35 U.S.C. § 102(b) as anticipated by Nippes et al. (U.S. Patent No. 6,460,013, hereinafter “Nippes”). Of these, claims 77, 89 and 93 are independent. The Applicants respectfully traverse this rejection as discussed below.

### ***Legal Precedent***

First, the pending claims must be given an interpretation that is reasonable and consistent with the *specification*. See *In re Prater*, 415 F.2d 1393, 1404-05, 162 U.S.P.Q. 541, 550-51 (C.C.P.A. 1969) (emphasis added); see also *In re Morris*, 127 F.3d 1048, 1054-55, 44 U.S.P.Q.2d 1023, 1027-28 (Fed. Cir. 1997); see also M.P.E.P. §§ 608.01(o) and 2111. Indeed, the specification is “the primary basis for construing the claims.” See *Phillips v. AWH Corp.*, No. 03-1269, -1286, at 13-16 (Fed. Cir. July 12, 2005) (*en banc*). One should rely *heavily* on the written description for guidance as to the meaning of the claims. See *id.*

Second, interpretation of the claims must also be consistent with the interpretation that *one of ordinary skill in the art* would reach. See *In re Cortright*, 165 F.3d 1353, 1359, 49 U.S.P.Q.2d 1464, 1468 (Fed. Cir. 1999); M.P.E.P. § 2111. “The inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to

begin claim interpretation.” See *Collegenet, Inc. v. ApplyYourself, Inc.*, 418 F.3d 1225, 75 U.S.P.Q.2d 1733, 1738 (Fed. Cir. 2005) (quoting *Phillips v. AWH Corp.*, 75 U.S.P.Q.2d 1321, 1326). The Federal Circuit has made clear that derivation of a claim term must be based on “usage in the ordinary and accustomed meaning of the words amongst artisans of ordinary skill in the relevant art.” See *id.*

Third, anticipation under section 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 U.S.P.Q. 773 (Fed. Cir. 1985). For a prior art reference to anticipate under section 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). To maintain a proper rejection under section 102, a single reference must teach each and every limitation of the rejected claim. *Atlas Powder v. E.I. du Pont*, 750 F.2d 1569 (Fed. Cir. 1984). Accordingly, the Applicants need only point to a single element not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter. The prior art reference also must show the *identical* invention “*in as complete detail as contained in the ... claim*” to support a *prima facie* case of anticipation. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989).

Fourth, if the Examiner relies on a theory of inherency, the extrinsic evidence must make clear that the missing descriptive matter is *necessarily* present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *In re Robertson*, 169 F.3d 743, 49 U.S.P.Q.2d 1949 (Fed. Cir. 1999) (Emphasis Added). The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient. *Id.* In relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic *necessarily* flows from the teachings of the applied prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). The Examiner, in presenting the inherency argument,

bears the evidentiary burden and must adequately satisfy this burden. *See id.* Regarding functional limitations, the Examiner must evaluate and consider the functional limitation, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. *See* M.P.E.P. § 2173.05(g); *In re Swinehart*, 169 U.S.P.Q. 226, 229 (C.C.P.A. 1971); *In re Schreiber*, 44 U.S.P.Q.2d 1429, 1432 (Fed. Cir. 1997). If the Examiner believes the functional limitation to be inherent in the cited reference, then the Examiner “must provide some evidence or scientific reasoning to establish the reasonableness of the examiner’s belief that the functional limitation is an inherent characteristic of the prior art.” *Ex parte Skinner*, 2 U.S.P.Q.2d 1788, 1789 (Bd. Pat. App. & Inter. 1986).

Fifth, the *drawings* of the cited reference must be evaluated for what they *reasonably disclose and suggest* to one of ordinary skill in the art. *In re Aslanian*, 590 F.2d 911, 200 U.S.P.Q. 500 (CCPA 1979). Arguments based on dimensions of the drawing features are of little value where the reference does not disclose specific dimensions or any indication of whether the drawings are to scale. *See Hockerson-Halberstadt, Inc. v. Avia Group Int’l*, 222 F.3d 951, 956, 55 U.S.P.Q.2d 1487, 1491 (Fed. Cir. 2000).

***The cited reference is missing features recited by independent claims 77.***

Turning to the claims, the present independent claim 77 recites, *inter alia*, “a turbomachine monitor configured to identify abnormal operational events as an indication of a rub in at least near real time between components of a turbomachine, wherein the abnormal operational events comprise an abnormal vibration value, an abnormal eccentricity value, an abnormal behavior associated with a transient condition, an abnormal behavior associated with a variation in load, an abnormal behavior associated with a variation in pressure, an abnormal steam characteristic of the turbomachine, an abnormal differential expansion, or a combination thereof.”

Nippes does not teach or suggest the foregoing features of independent claim 77. In the Office Action mailed on November 9, 2007, the Examiner referred to FIGS. 2c and 3; and column 3, lines 40-54 of Nippes. However, based on Applicants' review of Nippes, the Applicants stress that Nippes clearly fails to anticipate independent claim 77. For example, Nippes discloses:

Since the shaft grounding current and voltage are very sensitive to changes in the machinery, a developing problem can be detected long before there is damage and long before these are indicated by conventional monitors and/or unit instrumentation. An example of this is the occurrence of a shaft rub. The instant a metal-to-metal rub exists, the VCM system will detect an increase in the shaft grounding current and a decrease in the shaft voltage, while vibration and temperature sensors will not show indications of an abnormality until after the rub has existed long enough for damage to occur which produces excessive heat and vibration. It, should be noted that the VCM system warnings can be used in combination with temperature, vibration and other instruments. Nippes, col. 3, lines 40-54 (emphasis added).

First, in view of the foregoing passage, Nippes merely teaches current and voltage measurements, but not the various abnormal operational events recited by independent claim 77. Specifically, Nippes fails to teach or suggest "the abnormal operational events comprise an abnormal vibration value, an abnormal eccentricity value, an abnormal behavior associated with a transient condition, an abnormal behavior associated with a variation in load, an abnormal behavior associated with a variation in pressure, an abnormal steam characteristic of the turbomachine, an abnormal differential expansion, or a combination thereof," as recited by independent claim 77. Furthermore, although Nippes mentions measurements of temperature and vibration, Nippes clearly indicates that these measurements fail to provide a real time indication of an abnormality. In other words, as disclosed by Nippes, a long time would pass and damage would occur before vibration and temperature sensors would show any indications of an abnormality. Clearly, this passage indicates that temperature and vibration measurements are not used by Nippes "as an indication of a rub in at least near real time between components of a turbomachine," as recited by independent claim 77. For at least these reasons, among others,

Nippes cannot support a *prima facie* case of anticipation of independent claim 77 and its dependent claims.

***The cited reference is missing features recited by independent claim 89.***

Independent claim 89 recites, *inter alia*, “a turbomachine monitor configured to identify abnormal operational events as an indication of a rub between components of a turbomachine, wherein the abnormal operational events comprise a sudden change in vibration, a large variance in vibration relative to past data, or a large vibration amplitude relative to past data, or a combination thereof.”

Nippes does not teach or suggest the foregoing features of independent claim 89. In the Office Action mailed on November 9, 2007, the Examiner referred to FIG. 3; column 2, lines 22-39; and column 3, lines 24-54 of Nippes. However, based on Applicants’ review of Nippes, the Applicants stress that Nippes clearly fails to anticipate independent claim 89. For example, Nippes discloses:

Trending of shaft voltage/current over time indicates development of specific irregularities when they first occur, long before standard instruments and monitors respond to the abnormality. Traditional instruments and monitors indicate and/or alarm only after an abnormality has existed for sufficient time to generate enough heat, vibration, noise or contamination to be indicated or to set off an alarm, by which time, damage has already occurred. An advance warning is provided by the VCM system, either indicating a definite problem requiring action, or alerting operators that they should note trends of conventional instruments and monitors for potential development of a problem. Corrective measures, can then be implemented as the situation dictates, typically before damage occurs. Further, a prediction can be made as to the future of shaft voltage and current monitoring in rotating machinery, thus enabling the VCM system to act as a precursor and confirming factor in unit operation and maintenance. Nippes, col. 2, lines 22-39 (emphasis added).

Again, the Applicants stress that Nippes relies on voltage and current to identify irregularities, and clearly teaches away from traditional instruments that measure heat, vibration,

noise, etc. By further contrast, Nippes does not teach or suggest the abnormal operational events as recited by claim 89, e.g., “a sudden change in vibration, a large variance in vibration relative to past data, or a large vibration amplitude relative to past data, or a combination thereof.” Even though Nippes mentions vibration, it does not mention these specific abnormal operational events. There is simply no teaching or suggestion of a temporal factor, such as “sudden,” with regard to vibration. There is also no teaching or suggestion of a large variance in vibration “relative to past data.” Furthermore, there is no teaching or suggestion of a large “amplitude” in vibration “relative to past data.” Again, Nippes clearly teaches away from vibration measurements, and fails to disclose the specifically recited techniques of claim 89. For at least these reasons, among others, Nippes cannot support a *prima facie* case of anticipation of independent claim 89 and its dependent claims.

***The cited reference is missing features recited by independent claim 93.***

Independent claim 93 recites, *inter alia*, “a turbomachine monitor configured to monitor for abnormal operational events to identify a possible rub between components of a turbomachine in at least near real time, wherein the abnormal operational events comprise a sudden change, or a high variation, or a high value, or a combination thereof, of an operational parameter of the turbomachine, wherein the operational parameter comprises vibration amplitude.”

Nippes does not teach or suggest the foregoing features of independent claim 93. In the Office Action mailed on November 9, 2007, the Examiner referred to FIGS. 2c and 3; column 3, lines 24-54; and columns 2-3, lines 63-3 of Nippes. However, based on Applicants’ review of Nippes, the Applicants stress that Nippes clearly fails to anticipate independent claim 93. For example, Nippes discloses:

The VCM system utilizes real-time input of raw shaft quantities, grounding currents and shaft voltages. The signals are conditioned and converted for transmission to the signal processing and analysis system. The signals can equally

well be converted into other standard forms for serial and parallel digital interfaces. The particular types of interfaces as well as conversion between the forms of signals are well known to those skilled in the art. Nippes, columns 2-3, lines 63-3 (emphasis added).

Again, in view of the foregoing passage and the others discussed above, Nippes merely teaches current and voltage measurements, but not the various abnormal operational events recited by independent claim 93. Specifically, Nippes fails to teach or suggest “the abnormal operational events comprise a sudden change, or a high variation, or a high value, or a combination thereof, of an operational parameter of the turbomachine, wherein the operational parameter comprises vibration amplitude,” as recited by independent claim 93. Even though Nippes mentions vibration, it does not mention these specific abnormal operational events. There is simply no teaching or suggestion of a temporal factor, such as “sudden,” with regard to operation events, e.g., vibration amplitude. There is also no teaching or suggestion of a high variation or high value with regard to vibration amplitude. Again, Nippes clearly teaches away from vibration measurements, and fails to disclose the specifically recited techniques of claim 93. For at least these reasons, among others, Nippes cannot support a *prima facie* case of anticipation of independent claim 93 and its dependent claims.

As discussed above, although Nippes mentions measurements of temperature and vibration, Nippes clearly indicates that these measurements fail to provide a real time indication of an abnormality. In other words, as disclosed by Nippes, a long time would pass and damage would occur before vibration and temperature sensors would show any indications of an abnormality. For at least these reasons, among others, Nippes cannot support a *prima facie* case of anticipation of independent claim 93 and its dependent claims.

In view of these deficiencies, among others, Nippes cannot anticipate independent claims 77, 89 and 93 and their dependent claims.

**Rejections Under 35 U.S.C. § 103**

The Examiner rejected claims 1, 3, 4, 51, 52, 54, 56, 62, 64, 66, 68, 70, 72, 74, 67, 55, 73, 57, 58, 60, 61, 87, 91 and 104 under 35 U.S.C. § 103(a) as being unpatentable over Nippes in view of Sato et al. (U.S. Patent No. 4,478,082, hereinafter “Sato”). Claims 63, 65, and 69 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nippes in view of Sato and further in view of Wakeman et al. (U.S. Patent No. 5,601,403, hereinafter “Wakeman”). Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nippes in view of Sato and further in view of in view of Turbine power systems conference (February 25-26, 2002). Claims 82, 100, 80 and 98 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nippes in view of Wakeman. Of these, claims 1, 3, 4, 51, 52, 54 and 56 are independent. The Applicants respectfully traverse these rejections as discussed below.

***Legal Precedent***

The pending claims must be given an interpretation that is reasonable and consistent with the *specification*. See *In re Prater*, 415 F.2d 1393, 1404-05, 162 U.S.P.Q. 541, 550-51 (C.C.P.A. 1969) (emphasis added); see also *In re Morris*, 127 F.3d 1048, 1054-55, 44 U.S.P.Q.2d 1023, 1027-28 (Fed. Cir. 1997); see also M.P.E.P. §§ 608.01(o) and 2111. Indeed, the specification is “the primary basis for construing the claims.” See *Phillips v. AWH Corp.*, No. 03-1269, -1286, at 13-16 (Fed. Cir. July 12, 2005) (*en banc*). One should rely *heavily* on the written description for guidance as to the meaning of the claims. See *id.*

Interpretation of the claims must also be consistent with the interpretation that *one of ordinary skill in the art* would reach. See *In re Cortright*, 165 F.3d 1353, 1359, 49 U.S.P.Q.2d 1464, 1468 (Fed. Cir. 1999); M.P.E.P. § 2111. “The inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation.” See *Collegenet, Inc. v. ApplyYourself, Inc.*, 418 F.3d 1225, 75 U.S.P.Q.2d 1733, 1738 (Fed. Cir. 2005) (quoting *Phillips v. AWH Corp.*, 75 U.S.P.Q.2d 1321, 1326). The Federal Circuit has made clear that derivation of a claim term must be based on “usage in the ordinary



and accustomed meaning of the words amongst artisans of ordinary skill in the relevant art.” See *id.*

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). In addressing obviousness determinations under 35 U.S.C. § 103, the Supreme Court in *KSR International Co. v. Teleflex Inc.*, No. 04-1350 (April 30, 2007), reaffirmed many of its precedents relating to obviousness including its holding in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). In *Graham*, the Court set out an objective analysis for applying the statutory language of §103:

Under §103, the scope and content of the prior art are to be determined, differences between the prior art and the claims at issue are to be ascertained, and the level of ordinary skill in the pertinent art are to be resolved. Against this background the obviousness or non-obviousness of the subject matter is to be determined. Such secondary considerations as commercial success, long-felt but unresolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. *KSR, slip op.* at 2 (citing *Graham*, 383 U.S. at 17-18).

In *KSR*, the Court also reaffirmed that “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *Id.* at 14. In this regard, the *KSR* court stated that “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does ... because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *Id.* at 14-15. Traditionally, to establish a *prima facie* case of obviousness, the CCPA and the Federal Circuit have required that the prior art not only include all of the claimed elements, but also some teaching, suggestion, or motivation to combine the known elements in the same manner set forth in the claim at issue. See, e.g., *ASC Hospital Systems Inc. v. Montifiore Hospital*, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984) (holding that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion

supporting the combination.); *In re Mills*, 16 U.S.P.Q.2d 1430, 1433 (Fed. Cir. 1990) (holding that the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination). In *KSR*, the court noted that the demonstration of a teaching, suggestion, or motivation to combine provides a “helpful insight” in determining whether claimed subject matter is obvious. *KSR*, *slip op.* at 14. However, the court rejected a *rigid* application of the “TSM” test. *Id.* at 11. In this regard, the court stated:

The obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and explicit content of issued patents. The diversity of inventive pursuit and of modern technology counsels against limiting the analysis in this way. In many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends. *Id.* at 15.

In other words, the *KSR* court rejected a rigid application of the TSM test which requires that a teaching, suggestion or motivation to combine elements in a particular manner must be explicitly found in the cited prior art. Instead, the *KSR* court favored a more expansive view of the sources of evidence that may be considered in determining an apparent reason to combine known elements by stating:

Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art all in order to determine whether there was an apparent reason to combine in the known elements in the fashion claimed in the patent at issue. *Id.* at 14.

The *KSR* court also noted that there is not necessarily an inconsistency between the idea underlying the TSM test and the *Graham* analysis, and it further stated that the broader application of the TSM test found in certain Federal Circuit decisions appears to be consistent with *Graham*. *Id.* at 17-18 (citing *DyStar Textilfarben GmbH and Co. v. C.H. Patrick Co.*, 464 F.3d 1356, 1367 (2006) (“Our suggestion test is in actuality quite flexible and not only permits

but *requires* consideration of common knowledge and common sense”); *Alza Corp. v. Mylan Labs, Inc.*, 464 F.3d 1286, 1291 (2006) (“There is flexibility in our obviousness jurisprudence because a motivation may be found *implicitly* in the prior art. We do not have a rigid test that requires a teaching to combine ... “)).

Furthermore, the *KSR* court did not diminish the requirement for objective evidence of obviousness. *Id.* at 14 (“To facilitate review, this analysis should be made explicit. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”); see also, *In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002) (holding that the factual inquiry whether to combine references must be thorough and searching, and that it must be based on *objective evidence of record*).

When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Federal Circuit has warned that the Examiner must not, “fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.” *In re Dembiczak*, F.3d 994, 999, 50 U.S.P.Q.2d 52 (Fed. Cir. 1999) (quoting *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983)).

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. § 2145. Moreover, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); *see* M.P.E.P. § 2143.01(VI). If the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); *see* M.P.E.P. § 2143.01(V).

***Independent claims 1, 3, 4, 51, 52, 54 and 56 recite features missing from cited references, taken alone or in hypothetical combination with one another.***

Turning to the claims, the present independent claim 1 recites, *inter alia*, “the abnormal behavior comprises a high vibration amplitude relative to a baseline, or a high variation in vibration amplitude, or a sudden change in vibration amplitude, or a combination thereof.”

Independent claim 3 recites, *inter alia*, “determining whether a rub is occurring between tip portions of the plurality of blades and corresponding seal portions of the turbomachine based at least in part on a high variation in vibration amplitude, or a sudden change in vibration amplitude, or a combination thereof.”

Independent claim 4 recites, *inter alia*, “determining whether a rub is occurring between tip portions of the plurality of blades and corresponding seal portions of the turbomachine in at least near real time based at least in part on an abnormal vibration relative to a historical trend, wherein the abnormal vibration comprises a sudden change in vibration amplitude.”

Independent claim 51 recites, *inter alia*, “detecting whether a rub is occurring in the turbomachine between tip portions of the plurality of blades and corresponding seal portions of

the turbomachine in at least near real time based on an abnormal vibration value, an abnormal eccentricity value, an abnormal response to a transient condition, an abnormal response to a variation in load, an abnormal response to a variation in pressure, or an abnormal differential expansion of the stator and the rotor, or a combination thereof."

Independent claim 52 recites, *inter alia*, "a rub detection system configured to monitor the plurality of turbomachine sensors and to detect a turbomachine rub event occurring between tip portions of the plurality of blades and corresponding seal portions of the turbomachine based on one or more abnormal conditions, wherein the abnormal conditions comprise an abnormal vibration value, an abnormal eccentricity value, an abnormal response to a transient condition, an abnormal response to a variation in load, an abnormal response to a variation in pressure, and an abnormal differential expansion of the stator and the rotor."

Independent claim 54 recites, *inter alia*, "a rub detection system configured to monitor operational parameters of a turbomachine comprising a rotor, a stator, and a plurality of blades extending radially from the rotor, or the stator, or a combination thereof, wherein the rub detection system is configured to detect a turbomachine rub event occurring between tip portions of the plurality of blades and corresponding seal portions of the turbomachine based on one or more abnormal conditions, wherein the abnormal conditions comprise a high vibration amplitude relative to a baseline, a high variation in vibration amplitude, and a sudden change in vibration amplitude."

Independent claim 56 recites, *inter alia*, "the rub event occurs between tip portions of the plurality of blades and corresponding seal portions of the turbomachine, and the one or more abnormal conditions comprise a high vibration amplitude, a high variation in vibration amplitude, a sudden change in vibration amplitude, an abnormal eccentricity value, an abnormal response to a transient condition, an abnormal response to a variation in load, an abnormal

response to a variation in pressure, and an abnormal differential expansion of the stator and the rotor, and a combination thereof.”

Nippes does not teach or suggest the foregoing features of independent claims 1, 3, 4, 51, 52, 54 and 56. For example, as discussed in detail above with reference to the Section 102 rejections, Nippes fails to teach or suggest real time rub detection based on vibration, but rather relies on voltage and current. In fact, Nippes clearly indicates the failure of vibration measurements to identify a rub in real time. As discussed above, Nippes discloses:

Since the shaft grounding current and voltage are very sensitive to changes in the machinery, a developing problem can be detected long before there is damage and long before these are indicated by conventional monitors and/or unit instrumentation. An example of this is the occurrence of a shaft rub. The instant a metal-to-metal rub exists, the VCM system will detect an increase in the shaft grounding current and a decrease in the shaft voltage, while vibration and temperature sensors will not show indications of an abnormality until after the rub has existed long enough for damage to occur which produces excessive heat and vibration. It, should be noted that the VCM system warnings can be used in combination with temperature, vibration and other instruments. Nippes, col. 3, lines 40-54 (emphasis added).

Although Nippes mentions measurements of temperature and vibration, Nippes clearly indicates that these measurements fail to provide a real time indication of an abnormality. In other words, as disclosed by Nippes, a long time would pass and damage would occur before vibration and temperature sensors would show any indications of an abnormality. Clearly, this passage indicates that temperature and vibration measurements are not used by Nippes as an indication of a rub in at least near real time between components of a turbomachine. Nippes also fails to disclose specific abnormalities associated with vibration measurements, e.g., a high vibration amplitude relative to a baseline, or a high variation in vibration amplitude, or a sudden change in vibration amplitude, and so forth. Again, Nippes is not relying on vibration measurements due to their failure to provide a real time indication of a rub. Nippes also fails to mention the other specific abnormalities recited by the present independent claims, e.g., an abnormal eccentricity

value, an abnormal response to a transient condition, an abnormal response to a variation in load, an abnormal response to a variation in pressure, or an abnormal differential expansion of the stator and the rotor, or a combination thereof. For at least these reasons, among others, the Examiner's reliance on Nippes for these claim features is insufficient to support a *prima facie* case of obviousness.

The secondary references, as set forth in the 35 U.S.C. § 103(a) rejections above, do not obviate these deficiencies of Nippes. Specifically, the Sato reference, the Wakeman reference, and the "Turbine power systems conference" reference fail to obviate the deficiencies of the Nippes reference. For at least these reasons, among others, any hypothetical combination of the Nippes reference, the Sato reference, the Wakeman reference and the "Turbine power systems conference" reference cannot support a *prima facie* case of obviousness of the present claims.

For at least these reasons, among others, the Applicants respectfully request withdrawal of the foregoing rejections.

***Dependent claims 62, 66, 68, 70, 72 and 74.***

Dependent claims 62, 66, 68, 70, 72 and 74 recite a variety of features that are missing from the cited references, taken alone or in hypothetical combination. Each of these dependent claims generally recites a plurality of blades disposed on the rotor and corresponding seal portions disposed on the stator.

The Examiner stated on pages 14 and 15 of the Office Action mailed on November 9, 2007 that Nippes fails to teach or suggest the foregoing feature of blades being disposed on the rotor and corresponding seal portions being disposed on the stator as recited in dependent claims 62, 66, 68, 70, 72 and 74 and he relied on the Sato reference for the disclosure of the same elements. Applicants respectfully state that in sharp contrast with the current claims, Sato discloses a rub only occurring between a shaft and its corresponding bearing. Applicants have

carefully reviewed the sections (Col. 8, lines 24-41 and FIG. 8) referenced by the Examiner and submit that these sections fail to disclose any plurality of blades being disposed on the rotor and the corresponding seal portions being disposed on the stator as recited in dependent claims 62, 66, 68, 70, 72 and 74.

In view of the foregoing deficiencies in the teachings of the prior art, the references cannot establish a *prima facie* case of obviousness of claims 62, 66, 68, 70, 72. Accordingly, these claims are believed to be clearly patentable over the cited references. Their reconsideration and allowance are respectfully requested.

For at least these reasons, among others, the Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103.

#### **New claims**

As noted above, the Applicants added new claims 105-107, and believe these claims are in condition for allowance. For example, new dependent claim 105 recites, "the abnormal behavior comprises a sudden change in vibration amplitude." Similarly, the new dependent claims 106 and 107 recite, "the rub detection system is configured to monitor in real time." The cited references do not teach or suggest at least the foregoing features of the new dependent claims 105-107. Accordingly, the Applicants respectfully stress that the new dependent claims 105-107 are in condition for allowance.



**Conclusion**

The Applicants respectfully submit that all pending claims should be in condition for allowance. However, if the Examiner believes certain amendments are necessary to clarify the present claims or if the Examiner wishes to resolve any other issues by way of a telephone conference, the Examiner is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: February 7, 2008

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